CLAIMS

1.   A method for tracking and summarizing modified references in a garbage collector operating concurrently with applications, wherein a generation is partitioned into a group of memory sections and wherein there are card table indicators associated with the group of memory sections storing if an application has written into or dirtied one or more of the memory sections, the method comprising the steps of:

finding and atomically interrogating the indicators and finding at least one dirty indicator,

resetting the at least one found dirty indicator to indicate not dirty,

scanning the at least one dirtied memory section and updating the card table indicators or remembered sets of corresponding objects,

atomically interrogating the indicators again, and if none are dirty moving on to collect a next scheduled group of memory sections, and if at least one indicator is dirty,

preserving the indicators as just interrogated before moving on to another group of memory sections distant from the next scheduled group.

2.   The method of claim 1 further comprising the step of preserving information of references to a one younger generation.

3.   The method of claim 1 wherein the step of atomic interrogating comprises executing an instruction selected from the groups consisting of a compare-and-swap, a load-store-unsigned-byte, and the pair of instructions, load-locked and store-conditional.

4.   The method of claim 1 wherein the step of resetting of the dirty indicators comprises setting the dirty indicators to empty before scanning.

5.   The method of claim 1 wherein a dirty indicator contains all zeros and an empty indicator contains all ones.

6.   The method of claim 1 wherein each indicators comprises a byte.

1 7.   The method of claim 1 wherein the memory sections are defined as cards and the

2 indicators comprise a card table of bytes that correspond to the memory cards.

1 8.   A computer system for tracking and summarizing modified references in a gar-

2 bage collector operating concurrently with applications, wherein a generation is parti-

3 tioned into a group of memory sections and wherein there are card table indicators asso-

4 ciated with the group of memory sections storing if an application has written into or

5 dirtied one or more of the memory sections, the system comprising:

6   means for finding and atomically interrogating the indicators and finding at least

7 one dirty indicator,

8   means for resetting the at least one found dirty indicator to indicate not dirty,

9   means for scanning the at least one dirtied memory section and updating the card

10 table indicators or remembered sets of corresponding objects,

11   means for atomically interrogating the indicators again, and if none are dirty

12 moving on to collect a next scheduled group of memory sections, and if at least one indi-

13 cator is dirty, and

14   means for preserving the indicators as just interrogated before moving on to an-

15 other group of memory sections distant from the next scheduled group.

1 9.   The system of claim 8 further comprising means for preserving information of

2 references from at least one younger generation.

1 10.   The system of claim 8 wherein the means for atomic interrogating comprises an

2 instruction selected from the groups consisting of a compare-and-swap, a load-store-

3 unsigned-byte, and the pair of instructions, load-locked and store-conditional.

1 11.   The system of claim 8 wherein the means for resetting the dirty indicators com-

2 prises means for setting the dirty indicators to empty before scanning.

1   12.   The system of claim 8 wherein a dirty indicator contains all zeros and an empty

2   indicator contains all ones.

1   13.   The system of claim 8 wherein each indicator comprises a byte.

1   14.   The system of claim 8 wherein the memory sections are defined as cards and the

2   indicators comprise a card table of bytes that correspond to the memory cards.

1   15.   Electromagnetic signals propagating on a computer network comprising the elec-

2   tromagnetic signals carrying instructions for execution on at least one processor for the

3   practice of a method for tracking and summarizing modified references in a garbage col-

4   lector operating concurrently with applications, wherein a generation is partitioned into a

5   group of memory sections and wherein there are card table indicators associated with the

6   group of memory sections storing if an application has written into or dirtied one or more

7   of the memory sections, the method comprising the steps of:

8   finding and atomically interrogating the indicators and finding at least one dirty

9   indicator,

10   resetting the at least one found dirty indicator to indicate not dirty,

11   scanning the at least one dirtied memory section and updating the remembered

12 sets of corresponding objects,

13   atomically interrogating the indicators again, and if none are dirty moving on to

14 collect a next scheduled group of memory sections, and if at least one indicator is dirty,

15   preserving the indicators as just interrogated before moving on to another group

16 of memory sections distant from the next scheduled group.

1   16.   The electromagnetic signals of claim 15 further comprising signals for the prac-

2   tice of the step of preserving information of references from at lest one younger genera-

3   tion.

1   17.   The electromagnetic signals of claim 15 wherein the step of atomic interrogating

2   comprises executing an instruction selected from the groups consisting of a compare-and-

3 swap, a load-store-unsigned-byte, and the pair of instructions, load-locked and store-

4 conditional.

1 18. The electromagnetic signals of claim 15 wherein the step of resetting of the dirty

2 indicators comprises setting the dirty indicators to empty before scanning.

1 19. The electromagnetic signals of claim 15 wherein a dirty indicator contains all ze-

2 ros and an empty indicator contains all ones.

1 20. The electromagnetic signals of claim 15 wherein each indicator comprises a byte.

1 21. The electromagnetic signals of claim 15 wherein the memory sections are defined

2 as cards and the indicators comprise a card table of bytes that correspond to the memory

3 cards.

1 22. A computer readable media comprising: the computer readable media containing

2 instructions for execution in a processor for the practice of a method for tracking and

3 summarizing modified references in a garbage collector operating concurrently with ap-

4 plications, wherein a generation is partitioned into a group of memory sections and

5 wherein there are card table indicators associated with the group of memory sections

6 storing if an application has written into or dirtied one or more of the memory sections,

7 the method comprising the steps of:

8 finding and atomically interrogating the indicators and finding at least one dirty

9 indicator,

10 resetting the at least one found dirty indicator to indicate not dirty,

11 scanning the at least one dirtied memory section and updating the remembered

12 sets of corresponding objects,

13 atomically interrogating the indicators again, and if none are dirty moving on to

14 collect a next scheduled group of memory sections, and if at least one indicator is dirty,

15 preserving the indicators as just interrogated before moving on to another group

16 of memory sections distant from the next scheduled group.

1   23.   The computer readable media of claim 22 further comprising media containing

2   instructions for the practice of the step of preserving information of references from at

3   lest one younger generation.

1   24.   The computer readable media of claim 22 wherein the step of atomic interrogating

2   comprises executing an instruction selected from the groups consisting of a compare-and-

3   swap, a load-store-unsigned-byte, and the pair of instructions, load-locked and store-

4   conditional.

1   25.   The computer readable media of claim 22 wherein the step of resetting of the dirty

2   indicators comprises setting the dirty indicators to empty before scanning.

1   26.   The computer readable media of claim 22 wherein a dirty indicator contains all

2   zeros and an empty indicator contains all ones.

1   27.   The computer readable media of claim 22 wherein the indicators comprise a byte.

1   28.   The computer readable media of claim 22 wherein the memory sections are de-

2   fined as cards and the indicators comprise a card table of bytes that correspond to the

3   memory cards.